



Chapter 3 -MANDATORY REQUIREMENTS (TECHNICAL SPECIFICATIONS)

3.1 Scope

Iowa Public Television is accepting proposals to provide equipment, installation, support and training for a Digital Television distribution system. The system must at a minimum meet the specifications provided in this RFP.

The system must comply with current FCC and ATSC regulations. The system must be capable of 4:2:2 encoding of the NTSC signal, combining with the ATSC multiplexed ASI stream and converted to a G.703 DS-3 signal to feed the existing ICN fiber optic system ultimately feeding 9 digital / analog transmitters. At the transmitter sites the system must be capable of converting the stream back to a SMPTE-310 stream for digital transmission and to an analog signal for analog transmission. Seven (7) transmitter sites are co-located and two transmitter sites are non-co-located. DS-3 microwave links between non-co-located sites will be provided by IPTV. At the non co-located sites the DS-3 must be routed through the DS-3 Microwave to the digital sites. The system must provide return feeds of both ATSC and NTSC over the DS-3 for monitoring at the studio. The system must provide an Ethernet connection over the DS-3 for remote control use with the ATSC transmitters.

All analog remote controls are in place and operational but will be routed through this new system. The analog remote control is on Audio Channel 4 of the NTSC signal. The system as proposed must contain the latest version technology of each piece of equipment.

Harris has read and understands the above requirements for IPTV's installation of their new digital network. Harris has worked diligently to provide IPTV with the most technically advanced, operator friendly and cost-effective solution on the market. The Harris solution will provide all the functionality required by IPTV in the minimal amount of space and hardware.

3.2 Narrative

Iowa Public Television is a statewide network of nine transmitter sites covering the entire state of Iowa. We currently supply an analog NTSC television signal to our analog transmitters via the state owned fiber optic network utilizing Nortel DV45 encoder/decoders each on a dedicated DS-3. Each DS-3 circuit is a direct duplex feed to and from each transmitter. They cannot be combined at this time into OC3 lines in order to feed multiple transmitters on a single circuit. Nortel no longer supplies encoder/decoders; therefore we are looking for a new transport system. To reduce costs we plan to convert the NTSC analog signal to digital and combine it with the ATSC signal to distribute over the same DS3 fiber optic network currently in use. The ATSC signal will use 19.39Mb of the DS-3 and the NTSC signal will use the remaining bandwidth of the 45Mb DS-3. Note: The DS-3 system from the Network operations center to the ATSC transmitter will not support a clear channel DS-3 due to the FMT-150 equipment at the transmitters. At the transmitter sites the ICN demarcation point is an asynchronous DS3 port from a Nortel FMT-150B terminal shelf. Any means of synchronization must be performed within the DS3 payload using a method such as PLCP as opposed to a method using framing in the DS3 header such as Direct Map.

This is an example of a compatible interface:

Terawave INT-300 ATM DS3 NAU card connector: BNC

Line rate: 44.736 Mbps (+/-20 ppm at self timed, free running mode)

Line code: B3ZS

Framing format: C-bit parity

Test load impedance: 75 ohm +/-5%

Max distance: 450 ft.

Protocol: PLCP with clock recovery for synchronization and Direct Mapping

Note: FMT-150 requires PLCP mapping. Direct mapping will NOT work on this system.



Cell scrambling: on/off

Nominal peak voltage of a pulse: .36V to .85V

Pulse shape: conforms to G.703 section 8

Nominal pulse width: 22.4ns

BER: <10⁻¹²

Max peak-to-peak jitter at an output port: refer to G.824 Jitter tolerance at the output port: refer to clause G.824 Network timed (DS3 frame or PLCP)

*** FMT-150 requires PLCP. Direct mapping will NOT work on this system.

Onboard SMC free run clock.

Standards compliance: FCC Class B using shielded cable.

This must be a completely operational system with all necessary parts included in the bid. All equipment must be supplied with N+1 redundancy. Additional items that responding vendors deem necessary, should be included and should be listed as options with explanations as to why they are needed. AC power and floor space will be provided by IPTV. Any errors or omissions in this specification that are discovered by the responding parties shall be brought to the attention of IPTV engineering department for correction. If these specifications contain conflicts in quantity and or quality, the greater quantity and quality shall apply.

Because of the limited number of qualified IPTV personnel available, the successful respondent shall be responsible for installation, checkout and proof of the transmission system. All cable runs are underneath a computer floor and are NOT in an air plenum. IPTV will provide supervision for the installation. It is possible that our carrier will change to ATM in the future; therefore respondents must include a description of the steps to upgrade to ATM. At this time there are no details for the ICN ATM conversion.

Harris has read and understands the above objectives for the IPTV system. Please see the overall Harris technical solution for an explanation of Harris' plans to execute the installation.

3.3 Configuration

- A. The system shall include nine (9) SD 4:2:2 encoders plus one redundant encoder for encoding NTSC to multiplex with the ATSC ASI stream.

Harris has read and understands the above requirement. The Harris system architecture being proposed to IPTV does not require the use of nine individual SD encoders for each analog transmitter site. Harris proposes using its NetVx product for the encoding, decoding and distribution of all signals within this design. The NetVx will allow IPTV the ability to use one encoder to encode the NTSC feed from Master Control, at the same time within the NetVx that encoded signal can be routed to all the DS3 trunks that tie into the existing ICN system and sent out to the transmitter sites. This encoder card can be configured for N+N configuration and other cards can be added at a later time if different feeds are required for individual transmitter sites.

- B. The system shall include the necessary equipment to multiplex the ATSC and the NTSC streams onto the DS-3. (19.39Mb for ATSC and the remainder of the DS-3 for NTSC.)

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx will be installed with the appropriate multiplexer module to allow the importation of an external ASI Stream.

- C. The system shall take an ATSC ASI signal from a Statistical Multiplexer, combine it with a NTSC encoded ASI stream, and convert to nine (9) G.703 DS-3 signals to feed the ICN fiber system.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx system will internally route the incoming ATSC ASI stream and encoded NTSC stream to the appropriate DS3 output along with all appropriate IP information.

- D. The system shall support multiple I/O interfaces, and at a minimum the system shall be capable of supporting SMPTE-310, ASI, DVB-SPI, ATM, DS3, OC3, and E3.



Harris has read and understands the above requirements with exception. The NetVx solution proposed will support all the requested I/O with the exception of DVB-SPI. If a DVB-SPI interface is required then Harris will supply a converter to convert the signal to DVB-ASI.

- E. The system shall be capable of supporting up to nine (9) opportunistic data insertion systems. Each system will feed different data to each transmitter on the Statewide network. Note: The data casting systems will be a separate purchase and therefore should NOT be included in this RFP.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The system Harris is proposing can handle multiple streams that can be inserted into the NetVx through either DVB-ASI or transport stream data over UDP. The preferred method is UDP. The NetVx can mux the data PID information into the outbound mux for the ATSC transmission.

- F. The system must encode a return off-air feed of nine (9) ATSC and nine (9) NTSC signals over nine (9) DS-3 fiber circuits for monitoring at the point of origination. The NTSC signal must contain four (4) discrete audio channels. Channel 1 and 2 for stereo, channel 3 for SAP and channel 4 for remote control and status of the NTSC transmitter. The system must support and utilize existing Burk ARC16 and Gentner VRC2000 remote control systems. The system must not affect current dial in backup capability.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The HALENC511-STD encoder module has four analog audio inputs that can be configured to meet this requirement.

- G. The system must currently be in service in the US. A list of current users must be provided. Exceptions to any portion of the configuration not in current service must be stated.

Harris has read and understands the above requirement. Please see the Harris Experience/References document under tab 7 of the official technical proposal.

- H. The system shall be capable of supporting up to four (4) transport stream inputs for the purpose of feeding different programming (ASI streams, Multiplexed streams, ATSC/NTSC combination streams) to any or all of nine (9) DS-3 feeds to transmitter sites.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx will be configured with multiple ASI inputs that can be used to ingest external DVB-ASI streams.

- I. The system shall be configured with two SMPTE-310 outputs meeting ATSC specifications ready for direct connection to a DTV STL microwave transmitter.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx TMUX module can be configured for either SMPTE-310 or DVB-ASI.

- J. There shall be nine (9) decoders to decode the DS-3 signal to composite video with four (4) discrete channels of audio to feed the analog transmitters. Additional consideration will be given to any system that is able to encode a BTSC stereo signal at the studio for distribution to the NTSC transmitters.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx DEC-S11 decoder module will be installed at each site. The DEC-S11 will provide the composite NTSC video and four audio channels to the analog transmitter.

- K. The ATSC portion of the DS-3 shall be de-multiplexed and converted to a SMPTE 310 signal for transmission at each transmitter site.

Harris has read and understands the above requirement and meets this requirement with the proposed NetVx solution. The NetVx TMUX module can be configured for either SMPTE-310 or DVB-ASI.



3.4 Monitoring

- A. There shall be nine (9) VSB receivers with SMPTE 310 out that are stable enough to drive the DTV transmitter for use as back up feeds. This output must be auto switching in the event there is loss of the fiber signal. There must be a 3rd SMPTE 310 input to the auto switch for future satellite backup feed.

Harris has read and understands the above requirement and meets this requirement. Harris proposes using the Triveni StreamBridge PSIP Re-Generator and StreamScope ATSC Analyzer Monitor.

- B. There shall be five (5) decoders for monitoring ATSC at the studio (One for HD and four for SD) plus one redundant decoder.

Harris has read and understands the above requirement. Harris meets this requirement with four Harris TDR-30's and one Sencore 3384.

- C. There shall be nine (9) decoders for monitoring NTSC at the studio plus one redundant decoder.

Harris has read and understands the above requirement. Harris meets this requirement with the NetVX DECS11 cards.

- D. There shall be an ASI switcher for selection of each DTV site for monitoring along with a PSIP regenerator and a stream analyzer for signal evaluations. The PSIP regenerator is needed to avoid retuning the decoders for each of the nine (9) transmitter return feeds.

1. Stream analyzer shall have ASI input with optional VSB (RF) and The SMPTE-310 inputs. List costs for the options.

Harris has read and understands the above requirement and complies. Harris proposes using the Triveni StreamScope ATSC Analyzer Monitor, which is equipped with VSB (standard) ASI (option) and SMPTE-310 (option) interfaces.

2. The analyzer must display all PSIP and MPEG (PSI) fields.

Harris has read and understands the above requirement and complies. The ATSC Analyzer displays all PSIP in the CTA View and MPEG (PSI) field in the Stream Monitor View

3. The analyzer must have the ability to record and store a stream for future analysis.

Harris has read and understands the above requirement and complies.

4. The analyzer must have Ethernet connectivity.

Harris has read and understands the above requirement and complies.

5. The analyzer must have the capability of connecting to an alarm/notification system for constant monitoring.

Harris has read and understands the above requirement. The ATSC Analyzer can be equipped with a contact closure card. This card is optional.

6. The analyzer must have the ability to drive an external monitor.

Harris has read and understands the above requirement and complies. A monitor, keyboard and mouse are provided for in the quote 1-K6MSP.

7. The analyzer must be capable of upgrading to encompass all tables and fields defined in the ATSC A/65A specifications, and all subsequent amendments.



Harris has read and understands the above requirement. The system provided is field upgradeable.

8. The analyzer shall contain a logging function with the ability to store logs on a network drive.

Harris has read and understands the above requirement and complies.

9. The analyzer shall be rack mountable.

Harris has read and understands the above requirement and complies.

- E. ATSC monitors shall be a minimum of 15 inch rack mountable and NTSC monitors shall be a minimum of 9 inch rack mountable. 9 inch monitors will be mounted side by side two monitors in one rack frame.

Harris has read and understands the above requirements. Harris meets these requirements with the Ikegami HTM2050 ATSC monitor and the TM9-1 NTSC monitors.

- F. Any alternatives to section 3.4 (Monitoring) should be stated with reasons for using that method.

Harris has read and complies with the above requirements.

3.5 PSIP Regenerators

- A. The system shall include ten (10) PSIP regenerators.

Harris has read and understands the above requirement. Harris will provide the Triveni StreamBridge to meet this requirement.

- B. The regenerators must be able to take SMPTE 310 in, modify the VCT and PAT and output SMPTE 310 without degradation of the signal.

Harris has read and understands the above requirement and meets this requirement. Harris has researched available products and has determined that the Triveni StreamBridge meets the above requirement.

- C. The regenerators must be capable of remote control via IP with modem backup.

Harris has read and understands the above requirement. The Triveni StreamBridge meets this requirement.

3.6 Closed Caption

- A. The system shall include necessary equipment to convert EIA608 to EIA708 and pass through EIA708 captioning on each of five (5) DTV channels.

Harris has read and understands the above requirement. Harris complies with the Evertz 7760CCM-T.

- B. The system shall include necessary equipment to convert EIA708 to EIA608 on One (1) NTSC channel. There shall be redundancy for all equipment in the event of a failure.

Harris has read and understands the above requirement. Harris complies with the Evertz HD9084. .

3.7 Network Gateway requirements for video, audio and IP connectivity.

- A. The system proposed shall be capable of delivering services over a private DS-3 network from the head end to each site including internal decoder capability for SDI video and AES audio to feed existing NTSC transmitter services. The system shall be capable of providing services over the existing network and in addition must be capable of providing the same services over an ATM network in the future.

Harris has read and understands the above requirement. The proposed system meets this requirement. Please see the attached drawings and system functional description for clarification to this requirement.



- B. The NTSC signal must be mixed with an ATSC signal and put on a DS-3 fiber circuit. The NTSC signal must not be a part of the 19.4 MHz ATSC stream.

Harris has read and understands the above requirement. The design proposed meets this requirement.

- C. The system shall be capable of performing the required network interfacing and decoding functions as outlined in the block diagrams.

Harris has read and understands the above requirement. The design proposed meets this requirement.

The system shall allow control via front panel controls or by Simple Network Management Protocol (SNMP), in addition the SNMP must be controlled locally over an Ethernet Local Area Network (LAN) and in a wide-spread application over the ATM network

Harris has read and understands the above requirement. The design proposed meets this requirement. Please see the attached drawings and system functional description for clarification to this requirement.

- D. The system shall provide an alarm interface, which can light indicators on a status board, activate an audible alarm or connect to a site alarm system.

Harris has read and understands the above requirement and complies. Harris NetVx is equipped with four GPI/Os that can be configured as alarm closures.

- E. The system shall include in the DS-3 an Ethernet system with full duplex capability to all transmitter sites to use for monitoring, control, etc.

Harris has read and understands the above requirement. The design proposed meets this requirement. Please see the attached drawings and system functional description for clarification to this requirement.

- F. The system shall be capable of supporting ATM Adaptation Layer formats (AAL1 or AAL5)

Harris has read and understands the above requirement. The NetVx meets this requirement.

- G. The system shall be capable of supporting permanent virtual circuit (PVC) or switched virtual circuit (SVC) services.

Harris has read and understands the above requirement and the proposed system meets this requirement with exception. The NetVx solution proposed will use PVC for the connection to each transmitter site. Although the NetVx is capable of using SVC it was a decision of the development team to delay the implementation of SVC.

- H. The system shall be capable of supporting data rates up to 132 Mbps @ AAL5 (124Mbps @ AAL1).

Harris has read and understands the above requirement. The NetVx meets this requirement.

- I. The system shall be capable of supporting a variety of application interfaces including ASI, SMPTE 310, and SDI video (using integrated decoder for 4:2:0 or 4:2:2 MPEG video).

Harris has read and understands the above requirement. The proposed system meets this requirement.

- J. The system shall support ATM network interfaces for OC3c SM or MM, STM1o, STM1e, DS3, or E3

Harris has read and understands the above requirement and complies with explanation. The NetVx can support all listed interfaces with the exception of STM1e. An external converter is used to take STM1o to STM1e.



- A. The manufacturer shall have been engaged in the manufacturing of proposed DTV equipment for a minimum of three years.

Harris has read the above requirements and complies. Harris has been manufacturing DTV equipment since the start of the DTV roll out nearly ten years ago.

3.9 Support

- A. Must offer live 24-hour x 7-day phone support and must have a staff of full-time customer service engineers available for on-site service.

Harris has read the above requirements and complies.

- B. Annual cost for a service contract, including software and/or hardware upgrades, must be stated.

Harris has read the above requirements and complies. Please see the Price Schedule under tab 1 of the Official Cost Proposal.

- C. If a service contract is required for short response time during and/or after the warranty period, cost must be stated.

Harris has read the above requirements and complies. Please see the Price Schedule under tab 1 of the Official Cost Proposal.

- D. If different levels of service are available, this information with current pricing must be included in bid response.

Harris has read the above requirements and complies. Please see the Price Schedule under tab 1 of the Official Cost Proposal.

- E. The manufacturer shall maintain parts and service for a minimum of seven years after the sale of the equipment.

Harris has read the above requirements and complies.

- F. The manufacturer shall provide, at no charge, service bulletins to inform customers of modifications and improvements to the equipment. These bulletins shall provide instruction book updates when necessary.

Harris has read the above requirements and complies. Service bulletins are issued to customers when deemed appropriate by the Harris Service Department.

- G. The manufacturer shall supply two sets of instruction manuals with each part of the system. To clarify, there will be two (2) sets of manuals for all parts located at the master control end and eighteen (18) sets of manuals for all parts at each transmitter site, two (2) sets for each of nine (9) transmitters. These manuals shall include installation, operating and maintenance instructions and troubleshooting procedures. The manuals shall also include parts lists that include part number, circuit designator, and description and generic number wherever possible. The manuals shall also include wiring diagrams, board layouts, and schematics.

Harris has read the above requirements and complies with clarification. Manuals will be provided as stated above. Manuals do not include wiring diagrams, board layouts, and schematics.

- H. The manufacturer shall warrant the equipment to be free from defects in material and workmanship under normal use and service for a period of not less than one year, from the date of final acceptance of the working system. Where normal manufacturer warranties are greater than one year, those warranties will apply. The obligation under all warranties shall be limited to the replacement of defective components and to the



shipment of replaced parts to the purchaser FOB destination. Standard published warranties shall apply to any item not identified with the equipment manufacturer's trademark or trade name.

Harris has read the above requirements and complies.

3.10 Vendor Requirements

- a. The Vendor must disclose the timetable for installation and completion of a working system in Technical Proposal.

Harris has read the above requirements and complies. Please see Project Timeline under tab 1 of the Official Technical Proposal.

- b. The Vendor must have completed projects of similar size and scope.

Harris has read the above requirements and complies. Please see the Harris Experience/References document under tab 7 of the Official Technical Proposal.

- c. The Vendor must disclose any contract terminations including any damages or claims.

Harris has read the above requirements and complies.

3.11 Delivery

This system must be operational before May 1, 2004. Delivery time of equipment as bid and Installation timeline must be stated in the technical proposal.

Harris has read the above requirements and complies. Please see tab 2 and tab 3 of Official Technical Proposal.

3.12 Installation and Checkout

- A. The successful bidder will provide equipment racks for the system.

Harris has read and complies with the above requirements. Harris will provide the racks specified by IPTV.

- B. The racks shall be as follows:

Amco FX series vertical frames. These are 19" width and 30" deep racks with a louvered door on the rear.

FX78-19-30

2ea QCX90 top cowlings

2ea CBX19 bottom cowlings

DFHFE78-19L-L doors

Color is 116-T

Hardware is 10/32

Amco provided 72" 12 outlet plug mold, support clips, and plug mold adapter to allow a flexible electrical conduit connection.

The company is:

Dy-Tronix Inc

1221 Park Place N.E.

Cedar Rapids, IA 52402

Ph 319-294-9400; Fax 319-294-9300

Email cedar.rapids@dy-tronix.com

Contact David N. Miller

Harris has read and understands the above information.

- C. During installation at the transmitter sites, IPTV personnel will be instructed on how to connect to the DTV transmitter. Cables will be supplied for above connections.



Connections to uncompleted DTV transmitters at the time of vendor installation will be completed by IPTV personnel. The vendor will provide phone support during this process.

Harris has read the above requirements and complies.

- D. The successful bidder will provide installation instructions and layout drawings, including amount of rack space required.

Harris has read the above requirements and complies. Harris will provide two copies of all documentation and drawings on "D" size paper as well as on CD ROM for reference and permanent archiving. As built drawings will be provided within 6 weeks of project sign off.

- E. The successful bidder will provide a field service engineer to check out, configure, and initialize the system. Training of station personnel must be provided as part of this bid. Bidder must estimate time required to complete training as part of this bid. Travel and lodging for the field engineer is to be included in this bid.

Harris has read the above requirements and complies. Please see Price Schedule under tab 1 of Official Cost Proposal and tab 5 Training/Service Documents in Official Technical Proposal.

- F. In addition to installation, at least one day of operator training to be included and at least one day of on-site maintenance training shall be included during installation.

Harris has read the above requirements and complies. Please see Price Schedule under tab 1 of Official Cost Proposal and tab 5 Training/Service Documents in Official Technical Proposal.

3.13 Required Submittals

- A. Respondents must submit a basic line drawing and mechanical layout of their proposed system.

Harris has read and complies with the above requirements. Harris will provide conceptual drawings with proposal. Upon acceptance of contract, Harris will provide detailed installation drawings.

- B. Proposals shall include copies of equipment specification documentation, including manufacturer, and model numbers. Full manuals as described in section 5 above will be required at time of equipment delivery. Full manuals may be requested during the evaluation period if the evaluation committee deems them necessary for proper evaluation of proposed equipment.

Harris has read and complies with the above requirements. Please see tab 8 of Official Technical Response for product specification sheets. Please see the Price Schedule under tab 1 of the Official Cost Proposal for manufacturer and model numbers.

- C. The respondents and/or manufacturers shall supply AutoCAD (*. DWG) or (*. DXF) files of all layout and documentation drawings provided.

Harris has read and complies with the above requirements. Upon acceptance of contract, Harris will provide detailed drawings

- D. If requested during the evaluation period, respondents must bring in basic equipment to demonstrate proper operation over our ICN provided DS-3. Basic equipment would include a HD encoder, SD encoder for analog, multiplexer, ASI to DS-3 converter, DS-3 to ASI converter, NTSC decoder, and a decoder for ATSC. A high definition signal will



be encoded and multiplexed with the Analog NTSC encoded signal and sent to the transmitter. There it will be looped back on the return DS-3 and decoded at the studio. This will insure to all parties involved that the proposed system will work over the existing DS-3 fiber circuits.

Harris has read and complies with the above requirements. Harris requests a 30-day notice to organize and implement the product demonstration.

3.14 Upgrade and Expansion Capability

- A. The typical requirements and procedures necessary for upgrading the proposed system, must be stated whether hardware and/or software.

Harris has read and understands the above requirements. Software upgrades will occur through the installation of new software releases. Hardware upgrades will occur through the addition of specific cards to into the chassis of the NetVx.

- B. Consideration will be given to ability to upgrade and expand the system while remaining in service.

Harris has read the above requirements and complies. The NetVx is a modular solution that achieves the addition of services and functionality through the addition of cards to the existing NetVx chassis. This design will provide cost savings for future capabilities.

3.15 References

Respondents shall supply the names, address, phone numbers of not less than four entities, commercial or public broadcasting stations, which have installed equipment of similar scope and size.

Harris has read and complies with the above requirements. Please see Harris Experience/References document under tab 7 of the Official Technical Proposal.

3.16 Point of Contact

Successful bidder shall provide a single point of contact regarding all operations of the system.

Harris has read the above requirements and complies. Harris will place a Project Manager in charge as the single point of contact between Harris and IPTV.